

REMARKS/ARGUMENTS

Amendment to the claims

The above listing of claims will replace all prior versions and listings of claims in the application.

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Claims 1-16, 20-37, 41-46, 78-83, 86-87, 90-93 and 97-103 are rejected under 35 USC 103(a) as being unpatentable over Bicknell et al. (US pub. 2003/0193776) in view of Meehan et al. (US pub. 2004/0177218) and further in view of Rinaldis et al.(US pat. 7,107,343).

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Contents of the arguments:

A. arguments regarding amended independent claims 1, 21, 78 and 90

1. Regarding amended independent claim 1

15 Amended independent claim 1 comprises the patentably distinct feature of “wherein a new PSD can be attached to said external storage virtualization controller when said external storage virtualization controller is on-line.”

2. Regarding amended independent claim 78

20 Amended independent claim 78 comprises the patentably distinct feature of “wherein said group of PSDs include a first set of PSDs and a second set of PSDs, said first set of PSDs and said second set of PSDs are not received in a same enclosure, and said storage virtualization controller further comprises at least one multiple-device device-side expansion port for coupling to said second set of said PSDs.”

3. Regarding amended independent claim 90

25 Amended independent claim 90 comprises the patentably distinct feature of “wherein the external storage virtualization controller is configured to present redundantly a logical media unit on at least two of said plurality of host-side IO device interconnect ports.”

4. Regarding amended independent claim 21

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The reasons why amended independent claim 21 is patentably distinct from the cited references are as follows:

- 5 (a) The patentably distinct feature of “external” storage virtualization controller (SVC) of the present invention is not disclosed by the cited references.
- (b) The “CPC” of the present invention is not disclosed by the microprocessor 406 of Meehan, as discloses in para. 0028 thereof.
- 10 (c) The “at least one IO device interconnect controller” of the present invention is not disclosed by the FPGA 409 of fig.6 of Meehan, as discloses in para. 0028 thereof.
- (d) “the host-side IO device interconnect port and the device-side IO device interconnect port” are not disclosed by para.0029 of Meehan.

B. arguments regarding dependent claims 42 and 80

- 15 Claims 42 and 80 of the present invention comprise the patentably distinct feature of “an enclosure management services mechanism (EMS)”.

C. arguments regarding dependent claims 97, 98 and 99

- 20 Claims 97, 98 and 99 of the claimed invention comprise the patentably distinct feature of “wherein said group of PSDs are received in a plurality of enclosures.”

D. arguments regarding dependent claims 101 and 103

- 25 Claims 101 and 103 comprise the patentably distinct feature of “multiple-device device-side expansion port for coupling to said second set of said PSDs.” Please refer to above-mentioned point A, 2, in which there are arguments regarding amended independent claim 78.

Detailed explanation to the arguments will be provided as follows.

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A. arguments regarding amended independent claims 1, 21, 78 and 90

In order to overcome the rejections in the OA of 01/09/2009 made by the examiner, the applicant cancels claims 7, 29, and 102 and merges these claims into independent claims respectively.

5 In addition, in all the amended claims, though several occurrences of the phrase “storage virtualization controller (SVC)” has been newly amended to “**external** storage virtualization controller (SVC),” there is no new limitation introduced thereinto, since the phrase “**external** storage virtualization controller (SVC)” has been
10 being there in the independent claims 1, 21, 78, and 90, and the phrase “storage virtualization controller (SVC)” has originally meant “**external** storage virtualization controller (SVC).”

1. Regarding amended independent claim 1

Amended independent claim 1 comprises the patentably distinct feature of
15 “wherein a new PSD can be attached to said external storage virtualization controller when said external storage virtualization controller is on-line.” In other words, a new PSD can be attached to the external SVC even though the external SVC is on-line.

In contrast, what paragraph 0030 of Bicknell discloses, explains and describes the types of functions of disc drive interface 211 and the controller interfaces 209 and
20 210, but the applicant asserts that paragraph 0030 of Bicknell fails to teach or suggest that a new PSD can be attached to said storage virtualization controller when said storage virtualization controller is on-line.

2. Regarding amended independent claim 78

25 Amended independent claim 78 comprises the patentably distinct feature of “wherein said group of PSDs include a first set of PSDs and a second set of PSDs, said first set of PSDs and said second set of PSDs are not received in a same enclosure, and said storage virtualization controller further comprises at least one multiple-device device-side expansion port for coupling to said second set of said PSDs.” In order to
30 explain more regarding the meaning of expansion port for coupling to said second set

of said PSDs, please refer to paragraph [0092] of the present invention. Because the S-ATA specification only allows for maximum signal line lengths of 1.5 meter, the PSDs connected to one SVC must be packed close enough so that no signal line length exceeds 1.5meter. A typical S-ATA storage virtualization subsystem will only provide
5 for connection of a maximum of 16 S-ATA PSDs because of these limitations. So, a "pure" S-ATA storage virtualization subsystem is unable to match the expandability of a Fibre FC-AL storage virtualization subsystem, which will typically allow for connection of up to 250 PSDs via connection of external expansion chassis on the same set of device-side IO device interconnects. [0093] In order to overcome this
10 limitation, the present invention optionally includes one or more expansion device-side multiple-device IO device interconnects, herein referred to as device-side expansion ports, such as Parallel SCSI or Fibre FC-AL on the SVC. These interconnects will typically be wired in such a way as to allow external connection of external expansion chassis. These chassis could be simple "native" just a bunch of
15 drives (JBODs) of PSDs directly connected to the interconnect without any intervening conversion circuitry or could be intelligent JBOD emulation subsystems that emulate "native" JBODs using a combination of S-ATA or P-ATA PSDs and a single or redundant set of SVCs that provide the conversion from the multiple-device IO device interconnect protocol that provides the connection of the JBOD subsystem
20 to the primary storage virtualization subsystem to the device-side IO device interconnect (S-ATA or P-ATA) protocol that provides the connection between the JBOD SVC(s) and the PSDs that they manage. Therefore, in the claims of the present invention, said storage virtualization controller further comprises at least one multiple-device device-side expansion port for coupling to said second set of said
25 PSDs.

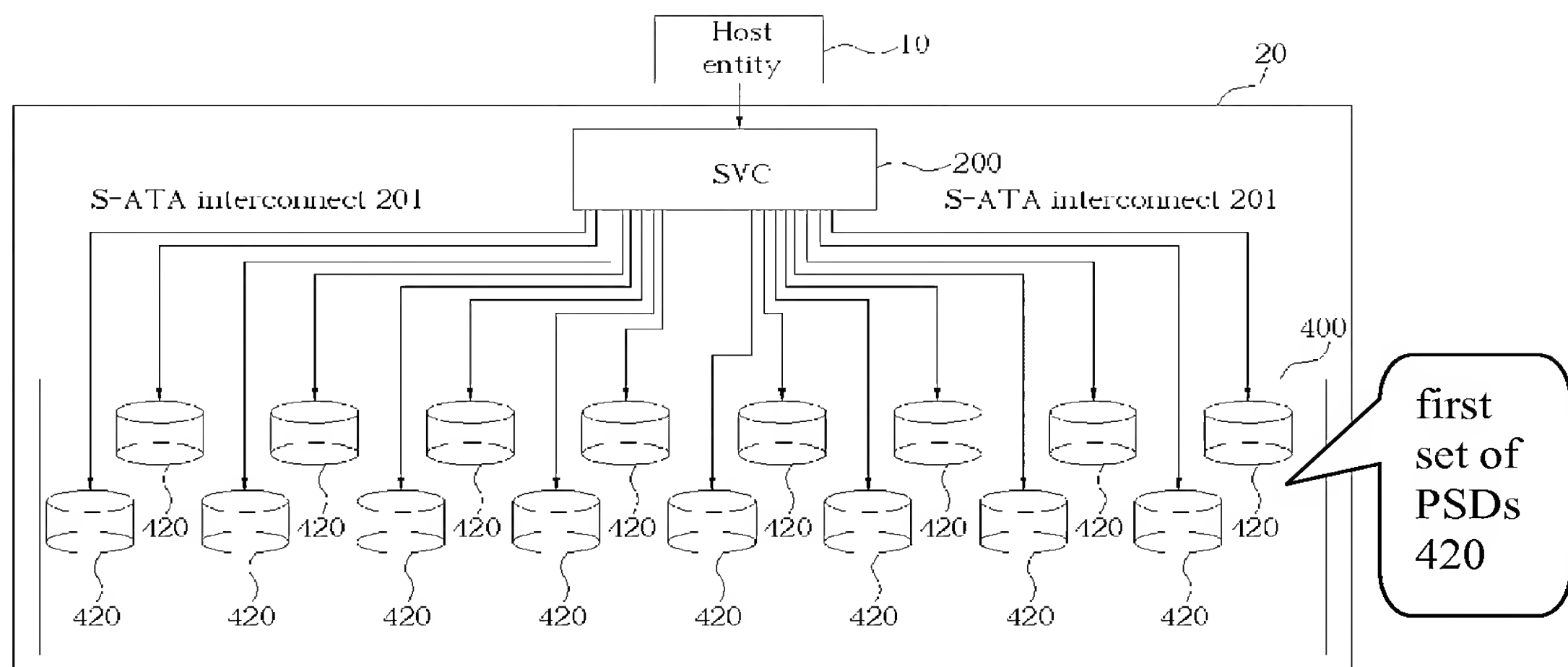


Fig. 3

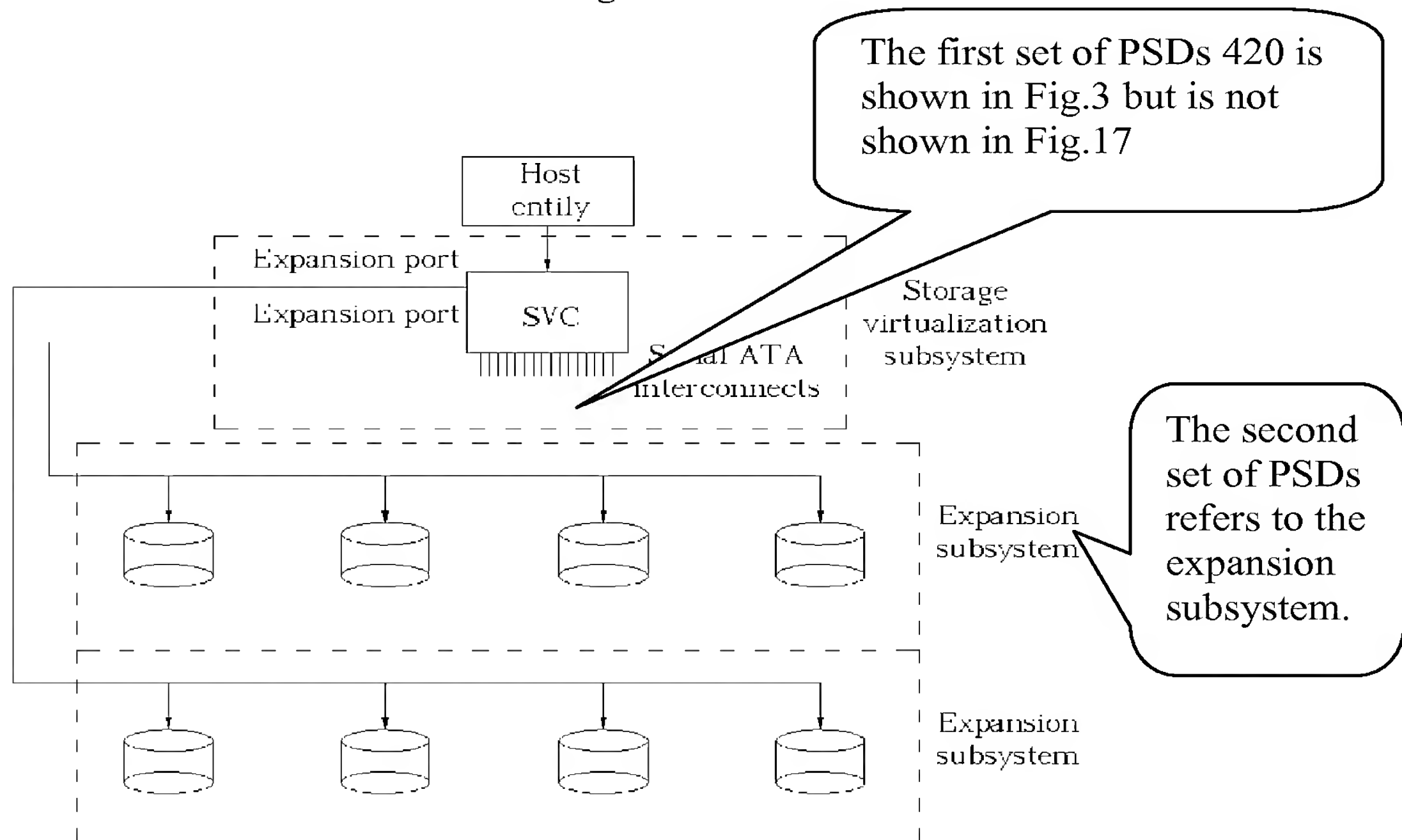


Fig. 17

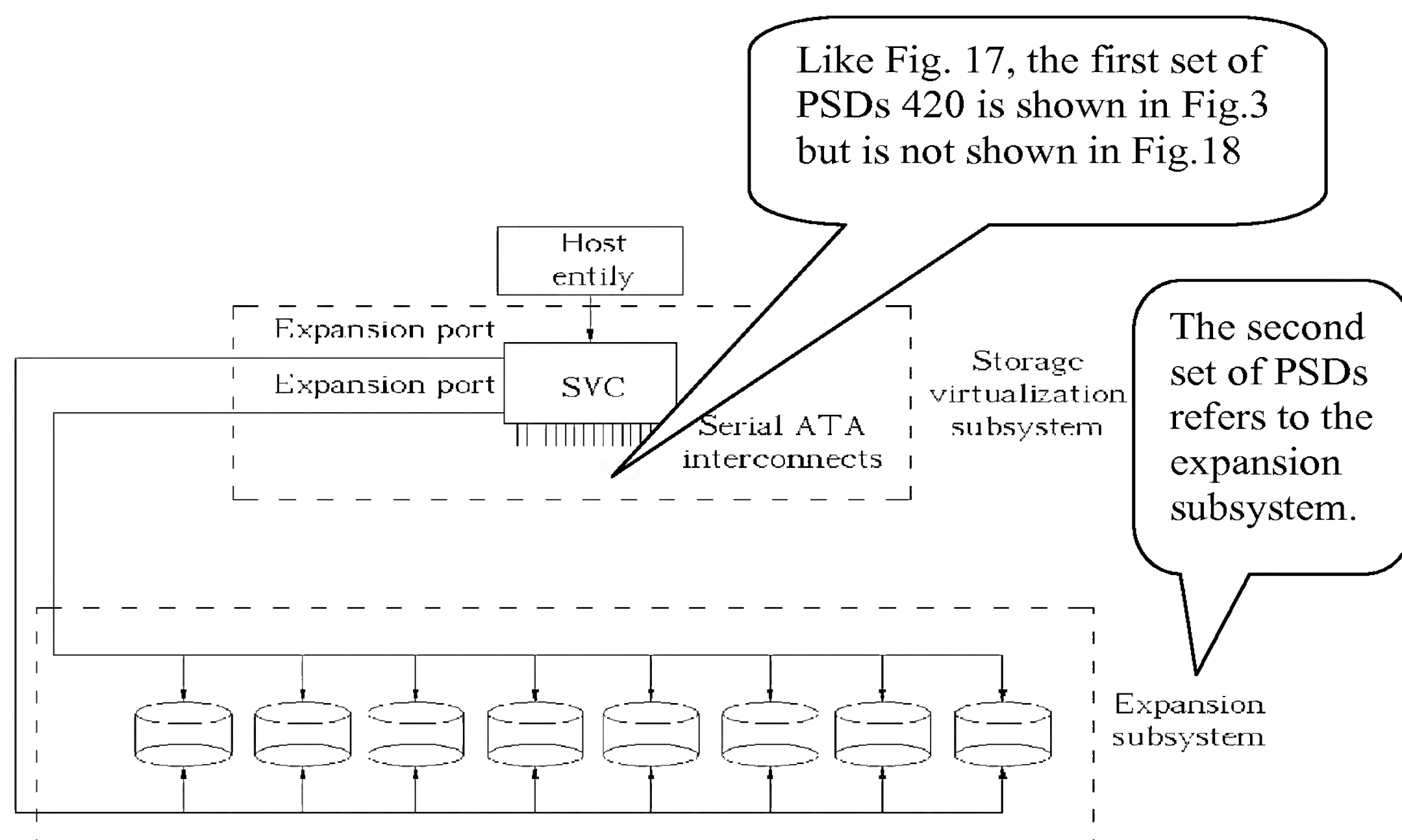


Fig. 18

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Moreover, please refer to above figs. 3, 17 and 18 of the present invention, in which in fig.3, there are 16 S-ATA interconnects 201 connected to **local** physical storage device array (PSD) 400 which comprises a plurality of physical storage devices 420 **(i.e., said first set of PSDs in fig.3 and in amended independent claims 78)**. However, please refer to figs. 17 and 18, in which in addition to the 16 Serial ATA interconnects that are connected to local PSD 400 (please refer to fig.3), storage virtualization controller (SVC) can optionally have more **expansion subsystems (i.e., said second set of said PSDs in fig. 17 and 18 and in amended independent claims 78) through the device-side expansion port for coupling to said second set of said PSDs (i.e., said expansion subsystem which is indicated by dotted lines in figs. 17 and 18).**

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In contrast, the Midplane Card ports 209 of Fig. 6 of Bicknell only discloses that the midplane card ports 209 are connected to data ports 204 of controllers 1 and 2 and

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that all the disc drives 106 are connected to the Midplane Card ports 209 through MUXs 208, all of which are received in the same housing (or “enclosure”) 102. Please also refer to Fig. 3, there is only one housing/enclosure 102, where both of the controllers 1 and 2, the Midplane Card 112, the MUXs 208, and the disc drives 106 are all received in the only one housing 102.

Therefore, from aforesaid viewpoint, it can be known that Bicknell does not at all disclose a second set of HDDs received in a second enclosure which is separate from the enclosure receiving all of the devices such as, the controllers 1 and 2, the Midplane Card 112, the MUXs 208, and the disc drives 106.

Thus Bicknell fails to teach or suggest “wherein said group of PSDs include a first set of PSDs and a second set of PSDs, said first set of PSDs and said second set of PSDs are not received in a same enclosure, and said storage virtualization controller further comprises at least one multiple-device device-side expansion port for coupling to said second set of said PSDs.” in amended independent claim 78 of the present invention

3. Regarding amended independent claim 90

Amended independent claim 90 comprises the patentably distinct feature of “wherein the external storage virtualization controller is configured to present redundantly a logical media unit on at least two of said plurality of host-side IO device interconnect ports.”

Moreover, please refer to paragraph [0098] of the present invention, in which another feature that an SVC might typically implement is redundancy in the host-side interconnects in which multiple host-side interconnect ports are included on the SVC and LMUs are presented to the host identically over two or more of these interconnects. This feature is designed to allow the host the ability to maintain access to the LMU even if one of the interconnects and/or ports on the interconnect should break, become blocked or otherwise malfunction. That is, said storage virtualization controller is configured to present redundantly a logical media unit on at least two of said plurality of host-side device interconnect ports twice.

In contrast, paragraph 0019 of Bicknell only discloses “Disc drive 106 also includes a data interface 144.....due to disc drive failure”, Please refer to Fig. 6 of Bicknell, in which two controllers, CONTROLLER 1 and CONTROLLER 2, are shown and each has only one interconnect coupled to a HOST COMPUTER to its left.

5 Obviously, Bicknell does not disclose or suggest a single controller having two ports connecting to a host for redundantly presenting a LMU to the host. Therefore, it is asserted that Bicknell fails to teach or suggest **“wherein said storage virtualization controller is configured to present redundantly a logical media unit on at least two of said plurality of host-side device interconnect ports.” in amended**

10 **independent claim 90.**

4. Regarding amended independent claim 21

(a) The patentably distinct feature of **“external”** storage virtualization controller (SVC) of the present invention is not disclosed by the cited references.

15 Applicants respectfully emphasizes that the **“external”** storage virtualization controller (SVC)” of the amended independent claim is a storage controller that is of an “external” type, i.e., **“external”** is one of the critical features of the amended independent claim.

As shown in the specification of the present invention, the meaning of a storage controller of an “external” type can be found as that an external (sometimes referred to as "stand-alone") storage virtualization controller (SVC) is a storage virtualization controller that connects to the host system via an IO interface and that is capable of supporting connection to devices that reside external to the host system. Therefore, the external storage virtualization controller is connected to the host entity

20 **through an IO interface.** Generally, using an IO interface/protocol may have a longer signal transmission distance and thus, have more stable signal transmission quality.

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In contrast, Bicknell in view of Meehan et al. and further in view of Rinaldis never mentions any words regarding “external virtualization storage controller” or “stand-alone virtualization storage controller”, in other words, all cited references

30 could only disclose an internal controller circuit card, but fail to disclose a storage

controller of an “external” type or “stand-alone” type, namely, an “external virtualization storage controller.”

- 5 (b) The “CPC” of the present invention is not disclosed by the microprocessor 406 of Meehan, as discloses in para. 0028 thereof.

The CPC 240 of the claimed invention comprises CPU 242 and CPU chipset 244 both. The functionality of the chipset 244 can be seen in paragraphs 0051~0053 of the specification of the claimed invention. In contrast, according to para. 0028 of Meehan, microprocessor 406 is a central processing unit (CPU) 406, which is not a
10 chipset and does not include the chipset 244 of the claimed invention at all. The chipset 244 included in CPC of the claimed invention is not disclosed by Meehan’s microprocessor 406.

- 15 (c) The “at least one IO device interconnect controller” of the present invention is not disclosed by the FPGA 409 of fig.6 of Meehan, as discloses in para. 0028 thereof.

On the page 5, lines 10 of the OA dated 01/09/2009, the examiner deemed that at least one IO device interconnect controller of amended independent claim 1 of the present invention is equal to FPGA 409 of fig.6, as discloses in para.0028 of Meehan.

20 However, the claimed invention recites the IO device interconnect controller (“at least one IO device interconnect controller”), which are not disclosed by the microprocessor 406 and the FPGA/ASIC 409.

From para. 0028, Meehan discloses that “The FPGA would also contain the algorithms to perform parity calculations for use in RAID 4/5 applications, and assignment of identification to the storage devices and RAID controllers at the lower
25 levels.” However, an IO controller can never perform any kind of parity calculations. The only function of an IO controller is to receive and transmit data from and to another device. Therefore, Meehan’s FPGA/ASIC 409 has never disclosed the claimed “IO controller” (or “IO device interconnect controller”).

- 30 (d) “the host-side IO device interconnect port and the device-side IO device

interconnect port” are not disclosed by para.0029 of Meehan.

On page 5, line 12 to page 6, line 4, the examiner deems that the Meehan’s interface 411 and para.0029 have disclosed the host-side IO device interconnect port and the device-side IO device interconnect port both.

5 The device-side IO device interconnect controller (hereinafter called “device-side IO controller” for short) of the present invention is in charge of communication with PSDs, which has “serial ports for coupling to said group of PSDs through said point-to-point serial-signal interconnect, said device-side IO device interconnect port being a serial port for point-to-point serial-signal
10 transmission.”

However, from fig.6 of Meehan, 411 looks like a cable, link or data path. The applicant is not quite sure, because Meehan only shows 411 in fig. 6 but has never explained or mentioned in his specification what exactly 411 is, and the only thing the applicant is quite sure is that 411 will neither be an interface nor be interconnect port.
15 Naturally, it could never be recognized as a serial port like the claimed invention.

In addition, each of the amended independent claims 1, 78, and 90 includes the above-mentioned features of claim 21 of the aforesaid points (a), (b), (c), and (d), and are in condition for allowance, too.

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The following points B, C, and D will explain some of the claimed features of the present invention, which, the applicant believes, have never been taught or discloses by all cited references.

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B. arguments regarding dependent claims 42 and 80

Claims 42 and 80 of the present invention comprise the patentably distinct feature of “an enclosure management services mechanism(EMS)”.

Please refer to paragraph [0056] of the present invention, in which in this
30 embodiment, an enclosure management service (EMS) circuitry 360 is attached to the

CPC 240 for managing and monitoring at least one of the following devices belonging to the storage virtualization subsystem 20: power supplies, fans, temperature sensors, voltages, uninterruptible power supplies, batteries, LEDs, audible alarms, PSD canister locks, door locks. However, in another arrangement of the SVS 20, the EMS circuitry 360 can be omitted, depending on the actual requirements of the various product functionality. Alternatively, the function of the EMS circuitry 360 can be incorporated into the CPC 240. Aspects of the EMS will be discussed later.

In contrast, paragraph 0037 of Bicknell and all of the cited references only discloses "The multiplexing electronics selectively opens and closes the first and second data communication paths", but fail to teach or suggest such EMS of the present invention. Since failing to teach or suggest such EMS, it is apparent that these claims can be patentably distinct from the cited references and thus are allowable.

C. arguments regarding dependent claims 97, 98 and 99

Claims 97, 98 and 99 of the claimed invention comprise the patentably distinct feature of "wherein said group of PSDs are received in a plurality of enclosures."

The meaning of "wherein said group of PSDs are received in a plurality of enclosures" is explained and shown in above Fig. 3, Figs 17 and 18 and paragraph [0093] of the present invention, in which [0093] In order to overcome this limitation, the present invention optionally includes one or more expansion device-side multiple-device IO device interconnects, herein referred to as **device-side expansion ports**, such as Parallel SCSI or Fibre FC-AL on the SVC. These interconnects will typically be wired in such a way as to allow external connection of external expansion chassis. These chassis could be simple "native" just a bunch of drives (JBODs) of PSDs directly connected to the interconnect without any intervening conversion circuitry or could be intelligent JBOD emulation subsystems that emulate "native" JBODs using a combination of S-ATA or P-ATA PSDs and a single or redundant set of SVCs that provide the conversion from the multiple-device IO device interconnect protocol that provides the connection of the JBOD subsystem to the primary storage virtualization subsystem to the device-side IO device interconnect (S-ATA or P-ATA)

protocol that provides the connection between the JBOD SVC(s) and the PSDs that they manage. That is, the expansion subsystem (i.e., **second set of PSDs** that is indicated by dotted lines in above Figs. 17 and 18) and the SVC including the PSDs (i.e. **first set of PSDs** that is shown in Fig.3 but is not shown in above Fig. 17 and 5 Fig.18, and is coupled to the SVC through Serial-ATA interconnected as shown in above Fig. 17 and 18) of storage virtualization subsystem (indicated by dotted lines in above Fig. 17 and Fig.18) **are received in a plurality of enclosures (different enclosures).**

10 In contrast, the applicant asserts that all cited reference fails to teach or suggest “wherein said group of PSDs are received in a plurality of enclosures.”

D. arguments regarding dependent claims 101 and 103

Claims 101 and 103 comprise the patentably distinct feature of “multiple-device device-side expansion port for coupling to said second set of said PSDs.”

15 Arguments regarding claims 101 and 103 both of which comprise “multiple-device device-side expansion port for coupling to said second set of said PSDs”, please refer to above-mentioned point A, 2, in which there are arguments regarding amended independent claim 78.

20 Reconsideration of the pending claims in view of the above arguments is respectfully requested.

25 Thus, all pending claims are submitted to be in condition for allowance with respect to the cited art for at least the reasons presented above. The Examiner is encouraged to telephone the undersigned if there are informalities that can be resolved in a phone conversation, or if the Examiner has any ideas or suggestions for further advancing the prosecution of this case.

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Amdt. dated July 09, 2009
Reply to Office action of January 09, 2009

Sincerely yours,

/Winston Hsu/

Date: 07/09/2009

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10 Note: Please leave a message in my voice mail if you need to talk to me. (The time in D.C. is 12 hours behind the Taiwan time, i.e. 9 AM in D.C. = 9 PM in Taiwan.)